

# Introduction and audit of a general practice antibiotic formulary

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**SUMMARY.** A survey of oral antibiotic prescriptions was carried out in a semi-urban general practice. From this a practice formulary was devised. The formulary was put into operation and the results of its introduction were reviewed after 12 months. There was a reduction in antibiotic costs without an increase in the number of patient consultations, home visits or referrals to hospital.

## Introduction

IN accordance with the Royal College of General Practitioners' policy statement *Quality in general practice*,<sup>1</sup> our practice decided to introduce an antibiotic formulary in the hope of improving our quality of care and accountability to our peers and gaining some valuable experience in research. After an audit of antibiotic prescribing in February 1986, a formulary was drawn up and introduced in April 1986 and its effects were assessed in February 1987 by again surveying the prescriptions from the local pharmacies.

## Method

At a business meeting of the nine-doctor practice in 1986 the authors were appointed to produce a practice formulary. It was decided to carry out an initial audit of the current antibiotic prescribing. None of the other doctors were informed of the method. On the last three days of February 1986 antibiotic prescriptions from the practice dispensed by three main local pharmacies were reviewed for the preceding period from 1 February 1986. Details of drug name, dose, formulation and length of treatment as well as patient name and age (if a child) were recorded.

Using knowledge gained from the survey combined with a literature search and help from the North West Regional Drug Information Unit a basic antibiotic formulary for use by our practice was drawn up. The common bacterial infections of general practice were given alongside the suggested list of suitable antibiotics, with advice on length of treatment and dosage where necessary. Figure 1 is an outline of its contents. Treatment lengths of seven days were recommended except where indicated. It was recommended that wherever possible the appropriate bacteriological investigations should be carried out before the antibiotic was commenced and the prescription be reviewed when the results of the bacterial investigations and antibiotic sensitivities were known.

The formulary was submitted to the other members of the practice, the local pharmacists and a microbiologist for scrutiny and comment. The formulary was introduced in April 1986 and its effects were assessed in February 1987 by again surveying the prescriptions from the local pharmacies.

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## Results

The figures in Table 1 show that a total of 537 oral antibiotic prescriptions were analysed in February 1986 and 559 in February 1987. We estimate that these represent approximately 85% of all antibiotic prescriptions issued from this practice for these periods. This is a conservative estimate based on the fact that the other pharmacies in the district are several miles from the practice.

The six most commonly prescribed antibiotics in February 1986 accounted for 79% of the total. In 1987 the top six antibiotics accounted for 89% of the total. It was found that even in 1986 the antibiotic range used by the practice was already relatively narrow (18 items, which is only a small proportion of the range available).

The largest changes were for co-trimoxazole, which fell from the second most commonly prescribed drug to seventh, and trimethoprim, which rose from being one of the rarely prescribed drugs to the second most common. There was a 60% increase in the number of prescriptions for erythromycin but no major changes in the numbers of prescriptions issued for penicillin V, flucloxacillin or oxytetracycline. Some of the less commonly prescribed antibiotics showed considerable changes in numbers that can be attributed to the introduction of the formulary. There were 20 cephalosporin scripts in February 1986 but only three in 1987, owing to a repeat prescription which was started in hospital. Pivampicillin plus pivmecillinam prescriptions dropped from 20 to seven. No amoxicillin plus clavulanate prescriptions were issued in February 1987.

After the introduction of the formulary the amount spent by the practice on antibiotics over one month showed a saving of

<i>Throat infections</i> <sup>2,3</sup>	<i>Acne vulgaris</i> <sup>10</sup>
Penicillin V, erythromycin	Oxytetracycline (250 mg bd for 3 months; increase to 500 mg bd if no or poor response), erythromycin (dose as above)
<i>Otitis media</i> <sup>4-6</sup>	
Amoxicillin, trimethoprim	
<i>Laryngotracheitis</i>	<i>Pelvic inflammatory disease</i> <sup>11</sup>
Amoxicillin, trimethoprim	Metronidazole and erythromycin or oxytetracycline/doxycycline
<i>Chest infections</i> <sup>7</sup>	
a) <i>Previously healthy</i>	<i>Urinary tract infection</i> <sup>12,13</sup>
Amoxicillin, erythromycin, oxytetracycline	a) <i>Non-pregnant women</i>
	Trimethoprim, amoxicillin
b) <i>Pre-existing chest problems</i>	b) <i>Pregnant women</i>
Amoxicillin, trimethoprim	Amoxicillin, nitrofurantoin
If pneumonia develops after influenza add flucloxacillin to cover staphylococcal pneumonia.	c) <i>Lower urinary tract infection</i>
	Nitrofurantoin
<i>Atypical infections</i> , <sup>7,8</sup> eg legionella, fever, psittacosis, mycoplasma	For short history, no haematuria, non-recurrent, no systemic features — 3 days treatment.
Oxytetracycline, erythromycin	
<i>Skin infections</i> <sup>9</sup> requiring systemic treatment	
Flucloxacillin, erythromycin	

Figure 1. The practice antibiotic formulary (references are shown to relevant literature).

£435. The largest saving (£182) came from the switch from co-trimoxazole to trimethoprim. The decrease in cephalosporins saved £70 and in pivampicillin plus pivmecillinam £64. Although the use of amoxicillin increased, the cost decreased by £75 because it was prescribed more often in the generic form.

Table 2 shows that there were little differences in consultations, home visits or hospital referrals in February 1987 compared with February 1986.

### Discussion

Some explanation of the choice of antibiotics for the formulary is needed. Amoxicillin was chosen because of its three times daily dosage; this fits with the work or school schedule of most patients, thereby improving compliance. The drug has a low side effect profile and has proven effectiveness. Although co-trimoxazole was the second most prescribed antibiotic in February 1986, after careful consideration it was decided that trimethoprim should replace it because according to the *Drug and Therapeutics Bulletin* 'trimethoprim alone causes fewer minor, and possible major, unwanted effects than co-trimoxazole and is cheaper'.<sup>14</sup> It is also questionable that the use of co-trimoxazole delays the emergence of resistance to trimethoprim, which was one of the major reasons for its continued use. The formulary led to an almost complete shift from co-trimoxazole to trimethoprim with a corresponding saving in cost. Penicillin V was selected as our drug of choice for bacterial throat infections with erythromycin as an alternative where this is penicillin

allergy or a twice daily dosage is desirable. Erythromycin usage increased considerably between 1986 and 1987. Flucloxacillin, our drug of choice for staphylococcal skin infections and for the occasional staphylococcal pneumonia, showed little movement in usage or in cost because even in February 1986 the majority of prescriptions were written generically. Oxytetracycline usage did not change much, which was to be expected since the indications for its use were not affected by the formulary. The shift towards increased prescribing of four of these six preferred antibiotics shows that the practice was complying with the formulary.

The introduction of the formulary in general led to decreases in prescriptions for the antibiotics which were not included or which had more precise indications for use. Cephalosporins were not considered to be a necessary part of this practice's armamentarium so were not included in the formulary and their routine usage stopped. Pivampicillin plus pivmecillinam (Miraxid, Leo) was also felt to be unnecessary and its usage dropped, with a corresponding cost saving. Metronidazole and nitrofurantoin were probably being used in a more rational manner after the introduction of the formulary and this led to a decrease in their usage. Minocycline (Minocin, Lederle) and sulfametopyrazine (Kelfizine W, Farmitalia Carlo Erba) were still used in small numbers; both are long-term therapies and had been initiated in hospital. The use of some newer antibiotics decreased but some others increased. Amoxicillin plus clavulanate (Augmentin, Beecham) was not used in February 1987, neither was nalidixic acid (Mictal, Winthrop) but drugs that were used in 1987 included pivampicillin (Pondocillin, Burgess), mainly because of its twice daily dosage, and ciprofloxacin (Ciproxin, Bayer), because of its anti-pseudomonas activity. This shows the need for constant updating of formularies.

This study has shown that introducing a formulary to a practice leads to savings in drug costs and a more unified approach to prescribing without any apparent detriment to the patients in terms of greater numbers of consultations, home visits or hospital referrals.

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**Table 1.** Comparison of prescription numbers and costs.

Antibiotic	Number of prescriptions		Cost (£)	
	Feb 1986	Feb 1987	Feb 1986	Feb 1987
†Amoxicillin	168	194	585	510
Co-trimoxazole	73	10	231	19
†Penicillin V	57	69	23	25
†Erythromycin	50	81	115	215
†Flucloxacillin	48	35	270	223
†Oxytetracycline	31	26	15	17
Cephalosporins	20	3	90	20
Pivampicillin + pivmecillinam	20	7	90	26
†Metronidazole	17	6	30	5
†Doxycycline	16	6	85	31
†Nitrofurantoin	12	6	35	35
Minocycline	7	6	125	107
Amoxicillin + clavulanate	4	0	35	0
†Trimethoprim	4	93	1	31
Ampicillin + flucloxacillin	3	4	15	14
Ampicillin	3	1	5	2
Sulfametopyrazine	3	8	17	36
Nalidixic acid + bicarbonate and citrate	1	0	2	0
Pivampicillin	0	2	0	3
Ciprofloxacin	0	2	0	15
Total	537	559	1769	1334

The prices used to carry out this exercise were drawn from the Drug Tariff and from the Chemist and Druggist price lists.

†Drugs included in the formulary.

**Table 2.** Number of patients, consultations, home visits and hospital referrals in the two audit months.

	February 1986	February 1987
Total number of patients in practice	16 797	16 743
Number of consultations	4262	4288
Number of home visits	675	684
Number of hospital referrals	185	187